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EXPANSION OF FOOD FISH SOURCES IN THE USSR

Ural Ripus as a Food Fish

Up to 1933, attempts were made to acclimatize whitefish from Lake Peipus and Lake Ladoga in Ural lakes (Sinara, Turgoyak, Tavatuy, and others). Notwithstanding the fast rate of growth of whitefish, it had not been possible to increase whitefish resources and at the same time raise the productivity of fish-breeding basins. For this reason it became necessary to find a variety of fish which could better utilize the plankton food resources of basins. The ripus proved to be such a variety.

In 1933, 5 million roe spawn of artifically fertilized roe of Ladoga ripus in the last stages of development were brought to Lake Tavatuy. Good results were achieved and in 1934 a much larger amount was brought in and distributed in Lake Tavatuy (15 million) and Lake Uvel'dy (15 million). In 1936, 5 million additional roe spawn were brought to Lake Tavatuy in order to accelerate the development of commercial ripus resources.

Beginning with the fall of 1937, commercial ripus was caught during the spawning season by gathering artificially fertilized ripus. At the same time, naturally fertilized spawn was saved. Ripus resources were increased and the ripus catch was regulated this way until 1940. The resources of ripus increased yearly and its physiological qualities improved noticeably in comparison with the ripus in Lake Ladoga.

During World War II intensive commercial fishing of ripus was carried on in the above-named lakes. The Ural population consumed ripus in large quantities.

In Lake Tavatuy during the past 3 years fishermen of the "Krasnyy Oktyabr'" Kolkhoz have caught more ripus than any other kind of fish. The productivity of the commercial fish catch in this lake constitutes (in kilograms per hectare):

Yr.	Ripus	Other Commercial Fish
1946	9	25
1947	31	20
1948	31	23

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These figures show that ripus has more than doubled the productivity of the commercial fish catch. Earnings of fishermen have increased more than seven times. The large ripus catches have proved to be one of the basic factors in strengthening fishing kolkhozes, since each kolkhoz home at the present time has electricity and a radio.

Good results in acclimatizing ripus were also obtained in Lake Uvel'dy.

Both lakes Tavatuy and Uvel'dy have bases for gathering ripus roe which undergoes incubation at the Arakul' Fish-Breeding Plant. Due to the need for additional fish-breeding plants, new ones are now under construction in Sverdlovsk and Chelyabinsk oblasts. This will allow for the expansion of ripus-breeding basins not only in the Urals but also in other regions.

During the propagating and catching of fish in Ural lakes, great care was taken not to overstock the lakes in order to provide the most favorable conditions for ripus development.

Ripus adapts easily to habitat conditions and grows to variable sizes. These characteristics were studied at Lake Shartash in Sverdlovsk Oblast, the fattening ground for the Sverdlovsk Fish-Breeding Economy. In 1946 Lake Shartash was stocked with fry from 5 million roe spawns, which, thriving on the luxuriant plankton, grew to record size. A one-year-old weighed 90 grams, a 2-year-old 290 grams, and a 3-year old 810 grams, while the average weight of industrial ripus is 300 grams.

During 1947 - 1948 catching ripus was begun in Lake Shartash. About 35,000 rubles' worth were caught and 3,000 rubles spent to restock the lake.

The results of acclimatization showed that the physiological qualities of Ladoga ripus in Ural basins considerably improved with each generation: the rate of growth increased; the ripus began to grow to larger proportions, it matured a year sooner -- in 2 instead of 3 years; and its fertility was increased many times. The primary value of ripus and the reason why it is being bred in lakes and ponds may be summed up as follows:

1. The early maturing and comparatively high fertility of ripus make it possible to create industrial reserves in basins fairly cheaply and in a short period of time.

2. Among the whitefish, ripus demands less in the way of a habitat and easily acclimates itself to new conditions. This makes it possible to widen its breeding grounds quickly.

3. It is superior to carp because of its tasty and more fatty meat.

4. It is very valuable from the piscicultural viewpoint since it feeds exclusively on plankton whereas most other fish do not. This aids considerably in increasing the productivity of fish-breeding basins.

Ripus spawns in the fall at the end of October and beginning of November. Roe incubation lasts 5 1/2 to 6 months. Gravel areas one or more meters in depth serve as natural spawning grounds for ripus. The presence of such areas with favorable gaseous conditions in winter (3-5 cubic meters of diluted oxygen for one liter of water) makes a basin most suitable for the full acclimatization of ripus.

It was formerly believed that ripus cold live and develop normally only in deep oligotrophic lakes or in not-sharply-defined eutrophic lakes with good gaseous water conditions. The results of ripus breeding in Lake Shartash show, however, that ripus can develop well in eutrophic lakes. The

predominant depth of Lake Shartash is up to 3 meters. Littoral water vegetation, mainly elodea, is here widely developed and flowers profusely during the summer when the water becomes very warm. The lake bottom has considerable silt deposits and only one-third of the shore zone is sandy. Summer conditions of Lake Shartash approach most nearly the conditions of a large carp pond. In winter the amount of oxygen is not stable. Oxygen content in the lower layers of water and in most areas is up to 20-30 percent saturation. Gaseous conditions improve somewhat in the sandy bottom areas.

The first spawning of ripus was carried on in Lake Shartash in 1947. Offspring had a fast rate of growth and in 1948 ripus spawning was repeated.

The experiments conducted in Lake Shartash provide the basis for the widespread breeding of Ural ripus in eutrophic lakes, which is necessary not only for the purpose of fattening them for commercial use but also to form a stock of fish producing a variety of roe that can be artif'cially fertilized for incubation at fish plants.

Ripus can and should be widely propagated in local lakes, not only in the northern and central regions, but in the western and even southern oblasts of the USSR.

Live ripus has little resistance to being moved, consequently it is not worth while to stock basins with mature, live fish for reproductive purposes. Fertilized ripus roe in a moist atmosphere, on the other hand, can withstand a long journey, one such journey having been 7 days in length.

Due to the compact packing and relatively light weight of tar and packing material, transporting roe is not expensive. In connection with the widespread use of air transport, it is possible to ship the roe in small packages by airplanes.

The means used to stock basins with ripus are very simple. Until the present, delivered ripus roe was usually dispersed on the gravel bottom through a hole made in the ice. By doing this, however, the roe going to the bottom was eaten by predatory fish. Furthermore, this means was not used in areas with silt deposits.

In the Shartash experiment, roe was placed in willow baskets of various sizes. The bottom of the basket was covered with a layer of small rocks or gravel on which ripus roe was evenly spread in one and a half or two layers. The top of the basket was covered wit' chain-stitch ordage to prevent predatory fish from entering it. The baskets with the roe were hung by ropes to poles fastened to the top of the ice or driven into the bottom of the basin. The baskets were then lowered into the middle of the water mass to a depth of 1 to 1.2 meters below the ice and not less than 1 to 1.5 meters from the basin bottom in the area of favorable gaseous conditions. They remained there until the fry left, then were removed.

The advantage of using baskets over fish-breeding apparatus is that baskets have no metal which might form oxides and react negatively on the roe; air circulates well through the walls of the baskets and the hatched fry are able to swim freely and independently from the basket into the basin. Nearly all the fry leave the basket in this manner.

In carp-breeding basins, much of the animal plankton is not eaten by the carp. For this reason raising industrial ripus in these basins as additional fish deserves serious attention.

Another characteristic of ripus is that it tries to go downstream with the water current. For this reason, lakes having an outlet must have a screen installed to keep the fish from going out. At the same time, this characteristic can be used in catching ripus when the water in breeding ponds is low.

As a new variety of fish, the Ural ripus should be widely propagated in lakes and ponds of the USSR, especially in Velikiye Luki and Novgorod oblasts and Belorussian SSR, where great improvements should be made in the quality of ichthyofauna and increasing productivity of industrial fish basins.

Propagation of Large-Mouthed Trout Perch in Ponds

One of the tasks of Soviet pisciculture is to introduce in pond breeding new species of fish which can utilize more fully the pond food resources and, by so doing, increase and improve fish production. Experimental work carried on by VNIIPRKh (All-Union Scientific Research Institute of Pond Fish Economy) shows that one of these new species of fish which can be bred in ponds and which adapts itself to lakes and reservoirs is the large-mouthed trout perch (Micropterus salmoides Lacepede) belonging to the family Centrarchidae, a near relative of the fresh-water perch.

The large-mouthed trout perch inhabits lakes, bays and rivers overgrown with vegetation, and even enters salty basins, but it prefers warm-water basins with silt bottoms 3-4 meters deep. It matures during its third or fourth year and can fertilize up to 10,000 roe or more, depending on its size. Its diet is extremely varied. It cannot be called a typical predatory fish since, besides fish, it eats insects, crustaceans, tadpoles, frogs, and other animals. Depending upon geographical circumstances, habitat conditions, and primarily the food available in the basin, the large-mouthed trout perch can grow very fast. It develops quickly and grows to a large size, particularly in basins containing many small fish.

In 1902 several large-mouthed trout perch were brought from Europe to Russia and deposited in Lake Abrau (Novorossiyskiy Rayon). In 1936 it was rediscovered and several specimens were transplanted from Lake Abrau into neighboring Lake Limanchik. Until the present time these two lakes have been the only ones in the Soviet Union to breed large-mouthed trout perch.

Lake Abrau is situated 75 meters above sea level among the extreme northwest spurs of the Caucasus chain. Conflicting opinions exist concerning the origin of the Lake. Because of some animals discovered there, some zoologists and hydrobiologists consider it to be very old. Geologists do not hold this opinion since investigation of the Abrau peninsula did not produce late marine deposits. The lake stretches north to south. It is 2 kilometers long, 0.5 kilometer wide, has a 100-hectare area, and a maximum depth of 14 meters. It is overgrown with plants only in the shallow northern part and at Nisonov Inlet. The bottom is rocky and ground deposits contain few organic substances. Fauna is sparse; certain organisms characteristic of fresh-water lakes are either not found at all or exist in small quantities. Ichthyofauna is not greatly varied and is found in small quantities. The fish found are carp (Scardinius erythrophtalamus), herring (ponto-kaspiysky relikt), kolkhidskiy minnows, and large-mouthed trout perch.

Lake Limanchik is situated in a chain of mountains on the banks of the Black Sea. The level of the lake is somewhat higher than the level of the sea. The area of the lake is about 2 hectares, the maximum depth 6 meters, and the bottom is of silt with a considerable amount of organic substances. Fauna here differs from Lake Abrau fauna in variety of species. The main types of fish in Lake Limanchik are carp (Rutilus frisii, Scardinius erythrophtalamus, Carassius vulgaris) and large-mouthed trout perch.

Experimental work with large-mouthed trout perch was begun by the Pond Fish Economy Institute in 1939 when perch was acclimatized in the Fastovetsk Fish Breeding Enterprise in Krasnodarsk Kray. During 1940 it spawned and wintered in carp ponds. Information about its nutrition and growth was gathered until the war interfered. The work was resumed again in 1946 and valuable information was obtained concerning the possibilities and expediency of breeding this fish in ponds and its acclimatization in lakes and reservoirs in the central zone of the USSR.

In 1948 the institute with the participation of the "Rybolov Sportsmen" society organized an expedition to catch large-mouthed trout perch in Lakes Abrau and Limanchik and to transport them to basins in Moscow and Voronezh oblasts. The period of catching lasted from 10 April to 15 May; catching was done chiefly by fixed nets and seines. The trout perch caught were kept in the usual wooden enclosures placed in the parts of lakes well protected from waves. Small fish were used to feed the trout perch. A few of the trout perch died and several had trauma.

Altogether, 472 large-mouthed trout perch were caught. Judging by their size, the 2- and 3-year-old fish were full grown. Prior to loading into live-fish carrying railroad cars located in Novorossiysk, the large-mouthed trout perch were transported from Lake Abrau by motorcar in tarpaulin tubs for 1 1/2 hours. From Lake Limanchik the trout perch were transported on a cutter, also in a tarpaulin tub, for 3 hours. From Novorossiysk to Moscow the trout perch were shipped in live-fish carrying railroad cars, taking 96 hours. At regular intervals the car was replenished with ice. Water in the car tanks was changed completely in Rostov and additional water was added in Ryazan. Only one fish died during the trip.

Along the way 15 mature large-mouthed trout perch were given to the "Niva" Fish Trust in Voronezh. After arriving in Moscow the remaining 456 fish were placed in ponds of the Savvinsk Enterprise, and later moved to other places: the "Nepreyka" Enterprise in Tul'a Oblast (4 fish); "Cherbonnaya Zor'ka" Enterprise in BSSR (10 fish); the Moscow Sea (Zavidovo Station) (25 fish); and Parkovyy Pond (Moskvorech' Station) in Moscow Oblast (205 fish).

A considerable number of the trout perch brought to the Savvinsk Enterprise ponds spawned at the end of May and the beginning of June. Over 7,000 fry were caught and raised in ponds of fish-breeding enterprises. Water temperature in ponds during the spawning corresponded to water temperature during spawning in Lakes Abrau and Limanchik.

According to observations made in 1946 - 1948 in Lakes Abrau and Limanchik and in 1948 in ponds, the nature of nutrition of large-mouthed trout perch depends upon their size, age, and the presence of and access to marine vegetation. Several periods should be clearly distinguished in the feeding of large-mouthed trout perch. In the early stages of life prior to the change to active feeding, the fry, reaching a length of 1.5 to 2.5 centimeters and weighing .05 to .30 grams, consumed varieties of small crustaceans. Upon attaining a length of 2.5 to 3 centimeters and weighing .3 to .5 grams, fish in ponds began to feed on tiny fish and pupae of insects; those in lakes fed on higher crustaceans and animal plankton.

On a fish diet, large-mouthed trout perch develop early, reaching a length of 10-11 centimeters and a weight of 25-30 grams in 3 to 4 months. The diet of the older groups of trout perch is determined by the marine vegetation available in the basin. In ponds where there are no small fish the trout perch feeds on insects, pupae, and tadpoles; in seas, on small fish, higher crustaceans, water insects, and pupae and larvae of water insects.

The growth of the large-mouthed trout perch depends upon habitat conditions. This fact was proved by the results of experiments conducted on one-year-old trout perch grown in Savvinsk Enterprise ponds on different diets. A one-year-old trout perch grown in a wintering pond stocked with 8,000 fish per hectare in one month weighed four times more than one-year-old fish with poor diets which remained in spawning basins. By October this difference had increased to 6.5 times. Trout perch in the spawning pond grew evenly and had an average weight of 2.5 grams; in the wintering pond the average weight of a one-year-old was 16 grams (with a range from 7 to 54 grams). In Zagorsk Enterprise, trout perch at first grew nearly on a level with the one-year-old trout perch in the Savvinsk wintering pond, but by October, due to the lack of marine vegetation, their intensive diet was reduced and they began to lag behind in their growth, attaining in October the average weight of 12.8 grams. In Golyavinsk Pond of the Yakhromsk Experimental Base, due to a plentiful diet and stocking of 2,000 fish per hectare, the one-year-old trout perch in October reached an average weight of 30 grams (with a range from 11 to 54 grams).

The one-year-old trout perch which were spawned in carp ponds of the Savvinsk Enterprise in Moscow Oblast did not lag behind, and in some cases grew faster than trout perch in Lakes Abrau and Limanchik in the northern Caucasus.

One-year-old trout perch in Lake Limanchik raised during 1937, the first year that the lake was stocked with large-mouthed trout perch, attained in November the average weight of 123 grams. This shows the wide range of possibilities in the growth of this fish.

To sum up, it may be said that the large-mouthed trout perch is distinguished by the following valuable features: early maturity, a highly variable diet, considerable possibilities for growth, ability to adapt itself to various habitat conditions, and high endurance, tasty meat, and value as an additional variety of fish for breeding.

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